WHAT IS CLAIMED IS:

1. A superconducting rotor assembly comprising:

an axial shaft;

a winding support structure;

a torque tube connected to said winding support structure; and

an interconnection assembly for mechanically coupling said torque tube to said axial shaft, said interconnection assembly being configured to convert a torsional torque load experienced by said torque tube to a tangential torque load which is provided to said axial shaft.

2. The superconducting rotor assembly of claim 1 wherein said interconnection assembly is configured to receive a tangential torque load which is a compression load.

3. The superconducting rotor assembly of claim 1 wherein said interconnection assembly is configured to receive a tangential torque load which is a tension load.

4. The superconducting rotor assembly of claim 1 wherein said interconnection assembly includes:

a torque tube flange for connecting said interconnection assembly to said torque tube;

an axial flange for connecting said interconnection assembly to said axial shaft; and

at least one thermally-insulating tangential load-bearing member for connecting said torque tube flange to said axial flange.

5. The superconducting rotor assembly of claim 4 wherein said axial flange is a collar.

6. The superconducting rotor assembly of claim 4 wherein said torque tube flange includes at least one protruding bracket assembly positioned radially about said torque tube

flange, said at least one protruding bracket assembly being configured to connect said torque tube flange to said at least one thermally-insulating tangential load-bearing member.

7. The superconducting rotor assembly of claim 4 wherein said axial flange includes at least one protruding bracket assembly positioned radially about said axial flange, said at least one protruding bracket assembly being configured to connect said axial flange to said at least one thermally-insulating tangential load-bearing member.

8. The superconducting rotor assembly of claim 4 wherein said at least one thermally-insulating tangential load bearing member is constructed of a high-strength low thermal conductivity composite material.

9. The superconducting rotor assembly of claim 8 wherein said high-strength, low thermal conductivity composite material is a G-10 phenolic material.

10. The superconducting rotor assembly of claim 1 wherein said torque tube is constructed of a high-strength, low thermal conductivity metallic material.

11. The superconducting rotor assembly of claim 10 wherein said high-strength, low thermal conductivity metallic material is Inconel.

12. The superconducting rotor assembly of claim 1 wherein a superconducting winding assembly is mounted to said winding support structure, wherein said superconducting winding assembly is constructed using a high-temperature superconducting material.

13. The superconducting rotor assembly of claim 12 wherein said high temperature superconducting material is chosen from the group consisting of: thallium-barium-calcium-copper-oxide; bismuth-strontium-calcium-copper-oxide; mercury-barium-calcium-copper-oxide; and yttrium-barium-copper-oxide.

14. The superconducting rotor assembly of claim 1 further comprising a refrigeration system for cooling said superconducting winding assembly.

15. The superconducting rotor assembly of claim 1 wherein an endplate is rigidly attached to said axial shaft and said interconnection assembly is rigidly attached to said end plate, whereby said interconnection assembly mechanically couples said torque tube to said axial shaft through said end plate.

16. The superconducting rotor assembly of claim 15 wherein said interconnection assembly includes:

a torque tube flange for connecting said interconnection assembly to said torque tube;

an axial flange for connecting said interconnection assembly to said end plate; and

at least one thermally-insulating tangential load-bearing member for connecting said torque tube flange to said axial flange.

17. An interconnection assembly for converting a torsional torque load experienced by a torque tube to a tangential torque load which is provided to an axial shaft comprising:

a torque tube flange for connecting said interconnection assembly to said torque tube;

an axial flange for connecting said interconnection assembly to said axial shaft; and

at least one thermally-insulating tangential load-bearing member for connecting said torque tube flange to said axial flange.

18. The interconnection assembly of claim 17 wherein said interconnection assembly is configured to receive a tangential torque load which is a compression load.

19. The interconnection assembly of claim 17 wherein said interconnection assembly is configured to receive a tangential torque load which is a tension load.

20. The interconnection assembly of claim 17 wherein said axial flange is a collar.

21. The interconnection assembly of claim 17 wherein said torque tube flange includes at least one protruding bracket assembly positioned radially about said torque tube flange, said at least one protruding bracket assembly being configured to connect said torque tube flange to said at least one thermally-insulating tangential load-bearing member.

22. The interconnection assembly of claim 17 wherein said axial flange includes at least one protruding bracket assembly positioned radially about said axial flange, said at least one protruding bracket assembly being configured to connect said axial flange to said at least one thermally-insulating tangential load-bearing member.

23. The insulating interconnection assembly of claim 17 wherein said at least one thermally-insulating tangential load bearing member is constructed of a high-strength low thermal conductivity composite material.

24. The interconnection assembly of claim 23 wherein said high-strength low thermal conductivity composite material is a G-10 phenolic material.

25. The interconnection assembly of claim 17 wherein said torque tube is constructed of a high-strength, low thermal conductivity metallic material.

26. The interconnection assembly of claim 25 wherein said high-strength, low thermal conductivity metallic material is Inconel.

27. The interconnection assembly of claim 17 wherein an endplate is rigidly attached to said axial shaft and said axial flange is rigidly attached to said end plate, whereby said axial flange is mechanically coupled to said axial shaft through said end plate.

28. The interconnection assembly of claim 27 wherein said axial flange includes at least one protruding bracket assembly positioned radially about said axial flange, said at least one protruding bracket assembly being configured to connect said axial flange to said at least one thermally-insulating tangential load-bearing member.

29. A superconducting rotor assembly comprising:

an axial shaft;

a winding support structure;

an asynchronous field filtering shield which surrounds said winding support structure, said asynchronous field filtering shield being connected to said axial shaft via one or more end plates positioned on distal ends of said shield; and

an interconnection assembly for mechanically coupling said winding support structure to said asynchronous field filtering shield, said interconnection assembly being configured to convert a torsional torque load experienced by said winding support structure to a tangential torque load which is provided to said asynchronous field filtering shield.

30. The superconducting rotor assembly of claim 29 wherein said interconnection assembly is configured to receive a tangential torque load which is a compression load.

31. The superconducting rotor assembly of claim 29 wherein said interconnection assembly is configured to receive a tangential torque load which is a tension load.

32. The superconducting rotor assembly of claim 29 wherein said thermally-insulating interconnection assembly includes one or more discrete torque transfer assemblies.

33. The superconducting rotor assembly of claim 32 wherein each said discrete torque transfer assembly includes:

at least one support structure bracket assembly rigidly attached to said winding support structure;

at least one shield bracket assembly rigidly attached to said asynchronous field filtering shield and positioned proximate said at least one support structure bracket assembly; and

at least one thermally-insulating tangential load-bearing member, positioned between said at least one support structure bracket assembly and said at least one

shield bracket assembly, for connecting said at least one support structure bracket assembly to said at least one shield bracket assembly.

34. The superconducting rotor assembly of claim 33 wherein said at least one thermally-insulating tangential load bearing member is constructed of a high-strength low thermal conductivity composite material.

35. The superconducting rotor assembly of claim 34 wherein said high-strength low thermal conductivity composite material is a G-10 phenolic material.

36. The superconducting rotor assembly of claim 33 wherein said at least one shield bracket assembly and said at least one support structure bracket assembly are constructed of a high-strength, low thermal conductivity metallic material.

37. The superconducting rotor assembly of claim 36 wherein said high-strength, low thermal conductivity metallic material is Inconel.

38. The superconducting rotor assembly of claim 29 wherein a superconducting winding assembly is mounted to said winding support structure, wherein said superconducting winding assembly is constructed using a high-temperature superconducting material.

39. The superconducting rotor assembly of claim 29 further comprising a refrigeration system for cooling said superconducting winding assembly.

40. An interconnection assembly for converting a torsional torque load experienced by a winding support structure to a tangential torque load which is provided to an asynchronous field filtering shield comprising:

one or more discrete torque transfer assemblies, each said discrete torque transfer assembly including:

at least one support structure bracket assembly rigidly attached to said winding support structure;

at least one shield bracket assembly rigidly attached to said asynchronous field filtering shield and positioned proximate said at least one support structure bracket assembly; and

at least one thermally-insulating tangential load-bearing member, positioned between said at least one support structure bracket assembly and said at least one shield bracket assembly, for mechanically coupling said at least one support structure bracket assembly to said at least one shield bracket assembly.

41. The thermally-insulating interconnection assembly of claim 40 wherein said interconnection assembly is configured to receive a tangential torque load which is a compression load.

42. The thermally-insulating interconnection assembly of claim 40 wherein said interconnection assembly is configured to receive a tangential torque load which is a tension load.

43. The thermally-insulating interconnection assembly of claim 40 wherein said at least one thermally-insulating tangential load bearing member is constructed of a high-strength low thermal conductivity composite material.

44. The thermally-insulating interconnection assembly of claim 43 wherein said high-strength low thermal conductivity composite material is a G-10 phenolic material.

45. The thermally-insulating interconnection assembly of claim 40 wherein said at least one shield bracket assembly and said at least one support structure bracket assembly are constructed of a high-strength, low thermal conductivity metallic material.

46. The thermally-insulating interconnection assembly of claim 45 wherein said high-strength, low thermal conductivity metallic material is Inconel.

47. A superconducting rotor assembly comprising:

an axial shaft;

a winding support structure;

at least one end plate rigidly attached to said axial shaft at a distal end of said winding support structure; and

an interconnection assembly for mechanically coupling said winding support structure to said at least one end plate, said interconnection assembly being configured to convert a torsional torque load experienced by said winding support structure to a tangential torque load which is provided to said at least one end plate.

48. The superconducting rotor assembly of claim 47 wherein said interconnection assembly is configured to receive a tangential torque load which is a compression load.

49. The superconducting rotor assembly of claim 47 wherein said interconnection assembly is configured to receive a tangential torque load which is a tension load.

50. The superconducting rotor assembly of claim 47 wherein said thermally-insulating interconnection assembly includes one or more discrete torque transfer assemblies.

51. The superconducting rotor assembly of claim 50 wherein each said discrete torque transfer assembly includes:

at least one support structure bracket assembly rigidly attached to said winding support structure;

at least one end plate bracket assembly rigidly attached to said at least one end plate and positioned proximate said at least one support structure bracket assembly; and

at least one thermally-insulating tangential load-bearing member, positioned between said at least one support structure bracket assembly and said at least one end plate bracket assembly, for connecting said at least one support structure bracket assembly and said at least one end plate bracket assembly.

52. The superconducting rotor assembly of claim 51 wherein said at least one thermally-insulating tangential load bearing member is constructed of a high-strength low thermal conductivity composite material.

53. The superconducting rotor assembly of claim 52 wherein said high-strength low thermal conductivity composite material is a G-10 phenolic material.

54. The superconducting rotor assembly of claim 51 wherein said at least one end plate bracket assembly and said at least one support structure bracket assembly are constructed of a high-strength, low thermal conductivity metallic material.

55. The superconducting rotor assembly of claim 54 wherein said high-strength, low thermal conductivity metallic material is Inconel.

56. The superconducting rotor assembly of claim 47 wherein a superconducting winding assembly is mounted to said winding support structure, wherein said superconducting winding assembly is constructed using a high-temperature superconducting material.

57. The superconducting rotor assembly of claim 47 further comprising a refrigeration system for cooling said superconducting winding assembly.

58. An interconnection assembly for converting a torsional torque load experienced by a winding support structure to a tangential torque load which is provided to at least one end plate comprising:

one or more discrete torque transfer assemblies, each said discrete torque transfer assembly including:

at least one support structure bracket assembly rigidly attached to said winding support structure;

at least one end plate bracket assembly rigidly attached to said at least one end plate and positioned proximate said at least one support structure bracket assembly; and

at least one thermally-insulating tangential load-bearing member, positioned between said at least one support structure bracket assembly and said at least one end plate bracket assembly, for connecting said at least one support structure bracket assembly and said at least one end plate bracket assembly.

59. The thermally-insulating interconnection assembly of claim 58 wherein said interconnection assembly is configured to receive a tangential torque load which is a compression load.

60. The thermally-insulating interconnection assembly of claim 58 wherein said interconnection assembly is configured to receive a tangential torque load which is a tension load.

61. The thermally-insulating interconnection assembly of claim 58 wherein said at least one thermally-insulating tangential load bearing member is constructed of a high-strength low thermal conductivity composite material.

62. The thermally-insulating interconnection assembly of claim 61 wherein said high-strength low thermal conductivity composite material is a G-10 phenolic material.

63. The thermally-insulating interconnection assembly of claim 58 wherein said at least one end plate bracket assembly and said at least one support structure bracket assembly are constructed of a high-strength, low thermal conductivity metallic material.

64. The thermally-insulating interconnection assembly of claim 63 wherein said high-strength, low thermal conductivity metallic material is Inconel.